



# Explosives Transportation





# Definition 49 CFR §173.50

- (a) *Explosive*. For the purposes of this subchapter, an *explosive* means any substance or article, including a device, which is designed to function by explosion (*i.e.*, an extremely rapid release of gas and heat) or which, by chemical reaction within itself, is able to function in a similar manner even if not designed to function by explosion, unless the substance or article is otherwise classed under the provisions of this subchapter. The term includes a pyrotechnic substance or article, unless the substance or article is otherwise classed under the provisions of this subchapter.





## §173.50

- Explosives in Class 1 are divided into six divisions as follows:
- **Division 1.1** consists of explosives that have a mass explosion hazard. A mass explosion is one which affects almost the entire load instantaneously.
- **Division 1.2** consists of explosives that have a projection hazard but not a mass explosion hazard.
- **Division 1.3** consists of explosives that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.
- **Division 1.4** consists of explosives that present a minor explosion hazard. The explosive effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package.
- **Division 1.5<sup>1</sup>** consists of very insensitive explosives. This division is comprised of substances which have a mass explosion hazard but are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport.
- **Division 1.6<sup>2</sup>** consists of extremely insensitive articles that do not have a mass explosion hazard. This division is comprised of articles that contain only extremely insensitive substances and that demonstrate a negligible probability of accidental initiation or propagation.





# Compatibility Group §173.52

Hazard division	Compatibility group													
	A	B	C	D	E	F	G	H	J	K	L	N	S	A-S
1.1	1.1A	1.1B	1.1C	1.1D	1.1E	1.1F	1.1G		1.1J		1.1L			9
1.2		1.2B	1.2C	1.2D	1.2E	1.2F	1.2G	1.2H	1.2J	1.2K	1.2L			10
1.3			1.3C			1.3F	1.3G	1.3H	1.3J	1.3K	1.3L			7
1.4		1.4B	1.4C	1.4D	1.4E	1.4F	1.4G						1.4S	7
1.5				1.5D										1
1.6												1.6N		1
Total	1	3	4	4	3	4	4	2	3	2	3	1	1	35





# EX Number

- **§173.56 New explosives—definition and procedures for classification and approval.**
- (a) Definition of new explosive. For the purposes of this subchapter a new explosive means an explosive produced by a person who:
  - (1) Has not previously produced that explosive; or
  - (2) Has previously produced that explosive but has made a change in the formulation, design or process so as to alter any of the properties of the explosive.An explosive will not be considered a “new explosive” if an agency listed in paragraph (b) of this section has determined, and confirmed in writing to the Associate Administrator, that there are no significant differences in hazard characteristics from the explosive previously approved.
- (b) Examination, classification and approval. Except as provided in §§173.64 and 173.65, no person may offer a new explosive for transportation unless that person has specified to the examining agency the ranges of composition of ingredients and compounds, showing the intended manufacturing tolerances in the composition of substances or design of articles which will be allowed in that material or device.....





# EX Number Responsibility

- Manufacturer
  - Designs and produces explosive and/or device
  - Adding approved explosive material to an additional device (squib added to actuator)
- Re-shipper/distributor
  - Changes in packaging (Approval specific)
  - Responsible for verifying EX number





# EX Number

- Submitted to approved explosives lab (6 labs)
- Multiple samples and proposed packaging
  - Chemical formula, percentages, (trade names)
- Submitted to PHMSA with lab report
- Maintain all documents (application, lab report)
- EX numbers not transferrable (bought out vs name change)
- Tested according to UN Manual of Tests and Criteria and §173.56 – §173.58





# Transporting Explosives

- §177.835 Transport by vehicle
  - Compatibility requirements
  - Packaging §173.63
  - IME – 22 box
- §176.100 – §176.194 Transport by vessel
- §175.78 Air - only 1.4S on passenger aircraft, certain 1.3 and 1.4 on cargo aircraft.





Class or division		Notes	1.1 1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3 gas zone A	2.3 gas Zone B	3	4.1	4.2	4.3	5.1	5.2	6.1 liquids PG I zone A	7	8 liquids only
Explosives	1.1 and 1.2	A	*	*	*	*	*	X	X	X	X	X	X	X	X	X	X	X	X	X
Explosives	1.3		*	*	*	*	*	X		X	X	X		X	X	X	X	X		X
Explosives	1.4		*	*	*	*	*	O		O	O	O		O				O		O
Very insensitive explosives	1.5	A	*	*	*	*	*	X	X	X	X	X	X	X	X	X	X	X	X	X
Extremely insensitive explosives	1.6		*	*	*	*	*													
Flammable gases	2.1		X	X	O	X				X	O							O	O	
Non-toxic, non-flammable gases	2.2		X			X														
Poisonous gas Zone A	2.3		X	X	O	X		X				X	X	X	X	X	X			X
Poisonous gas Zone B	2.3		X	X	O	X		O				O	O	O	O	O	O			O
Flammable liquids	3		X	X	O	X				X	O					O		X		
Flammable solids	4.1		X			X				X	O							X		O
Spontaneously combustible materials	4.2		X	X	O	X				X	O							X		X
Dangerous when wet materials	4.3		X	X		X				X	O							X		O
Oxidizers	5.1	A	X	X		X				X	O	O						X		O
Organic peroxides	5.2		X	X		X				X	O							X		O
Poisonous liquids PG I Zone A	6.1		X	X	O	X		O				X	X	X	X	X	X			X
Radioactive materials	7		X			X		O												
Corrosive liquids	8		X	X	O	X				X	O		O	X	O	O	O	X		



# Compatibility Table For Class 1 (Explosive) Materials

Compati bility group	A	B	C	D	E	F	G	H	J	K	L	N	S
A		X	X	X	X	X	X	X	X	X	X	X	X
B	X		X	X <sub>(4)</sub>	X	X	X	X	X	X	X	X	4/5
C	X	X		2	2	X	6	X	X	X	X	3	4/5
D	X	X <sub>(4)</sub>	2		2	X	6	X	X	X	X	3	4/5
E	X	X	2	2		X	6	X	X	X	X	3	4/5
F	X	X	X	X	X		X	X	X	X	X	X	4/5
G	X	X	6	6	6	X		X	X	X	X	X	4/5
H	X	X	X	X	X	X	X		X	X	X	X	4/5
J	X	X	X	X	X	X	X	X		X	X	X	4/5
K	X	X	X	X	X	X	X	X	X		X	X	4/5
L	X	X	X	X	X	X	X	X	X	X	1	X	X
N	X	X	3	3	3	X	X	X	X	X	X		4/5
S	X	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	X	4/5	





## Packaging §173.62(c)

131	Bags	Not Necessary	Boxes
<p>PARTICULAR PACKING REQUIREMENTS OR EXCEPTIONS:</p> <p>1. For UN 0029, 0267 and 0455, bags and reels may not be used as inner packagings</p> <p>2. For UN 0030, 0255 and 0456, inner packagings are not required when detonators are packed in pasteboard tubes, or when their leg wires are wound on spools with the caps either placed inside the spool or securely taped to the wire on the spool, so as to restrict free moving of the caps and to protect them from impact forces</p> <p>3. For UN 0360, 0361 and 0500, detonators are not required to be attached to the safety fuse, metal-clad mild detonating cord, detonating cord, or shock tube. Inner packagings are not required if the packing configuration restricts free moving of the caps and protects them from impact forces</p>	<p>paper plastics Receptacles fiberboard metal plastics wood Reels</p>		<p>steel (4A). aluminum (4B). other metal (4N). wood, natural, ordinary (4C1). natural wood, sift proof walls (4C2). plywood (4D). reconstituted wood (4F). fiberboard (4G). Drums. steel (1A1 or 1A2). Aluminum (1B1 or 1B2). other metal (1N1 or 1N2). Plywood (1D). fiber (1G). plastics (1H1 or 1H2).</p>





## 173.63 Exceptions

(f) Detonators containing no more than 1 g explosive (excluding ignition and delay charges) that are electric blasting caps with leg wires 4 feet long or longer, delay connectors in plastic sheaths, or blasting caps with empty plastic tubing 12 feet long or longer may be packed as follows in which case they are excepted from the packaging requirements of §173.62:

- (1) No more than 50 detonators in one inner packaging;
- (2) IME Standard 22 container (IBR, see §171.7 of this subchapter) or compartment is used as the outer packaging;
- (3) No more than 1000 detonators in one outer packaging; and
- (4) No material may be loaded on top of the IME Standard 22 container and no material may be loaded against the outside door of the IME Standard 22 compartment.

(g) Detonators that are classed as 1.4B or 1.4S and contain no more than 1 g of explosive (excluding ignition and delay charges) may be packed as follows in which case they are excepted from the packaging requirements of §173.62:

- (1) No more than 50 detonators in one inner packaging;
- (2) IME Standard 22 container is used as the outer packaging;
- (3) No more than 1000 detonators in one outer packaging; and
- (4) Each inner packaging is marked "1.4B Detonators" or "1.4S Detonators", as appropriate.





## §177.835(g)

(g) No detonator assembly or booster with detonator may be transported on the same motor vehicle with any Division 1.1, 1.2 or 1.3 material (except other detonator assemblies, boosters with detonators or detonators), detonating cord Division 1.4 material or Division 1.5 material. No detonator may be transported on the same motor vehicle with any Division 1.1, 1.2 or 1.3 material (except other detonators, detonator assemblies or boosters with detonators), detonating cord Division 1.4 material or Division 1.5 material unless—

(1) It is packed in a specification MC 201 (§178.318 of this subchapter) container; or

(2) The package conforms with requirements prescribed in §173.62 of this subchapter, and its use is restricted to instances when—

(i) There is no Division 1.1, 1.2, 1.3 or 1.5 material loaded on the motor vehicle; and

(ii) A separation of 61 cm (24 inches) is maintained between each package of detonators and each package of detonating cord; or

(3) It is packed and loaded in accordance with a method approved by the Associate Administrator. One approved method requires that—

(i) The detonators are in packagings as prescribed in §173.63 of this subchapter which in turn are loaded into suitable containers or separate compartments; and

(ii) That both the detonators and the container or compartment meet the requirements of the IME Standard 22 (IBR, see §171.7 of this subchapter).





# IME – 22 Box

3. The exterior walls and lid or door of each SLP-22 container or compartment shall consist of a laminate constructed of not less than 11 gauge steel, continuously welded at all joints, and lined with 1/2 inch sheetrock and 1/2 inch A/C grade or better exterior plywood as shown in Figure 5.

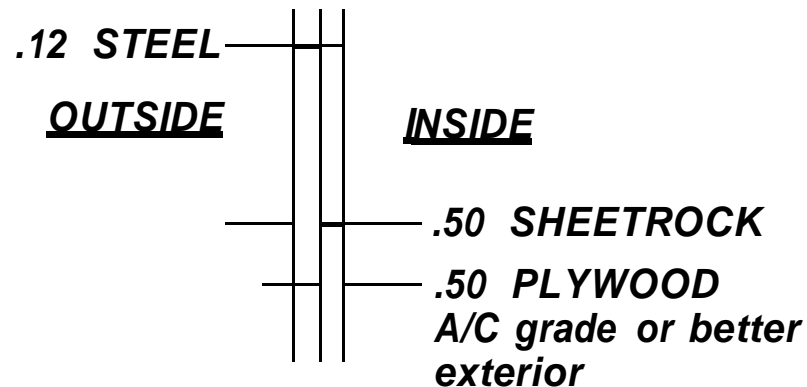


Figure 5. SLP-22 wall laminate shown with steel outer covering.





# IME – 22 Box

No material may be loaded on top of a portable SLP-22 container which contains Class 1 materials, nor is any material to be loaded against the outside of the door of an SLP-22 compartment.

When Class 1 materials are loaded in a portable SLP-22 container, the warning: **“CONTAINS EXPLOSIVES, HANDLE CAREFULLY”** must be displayed on the outside of the container’s lid in letters at least 1/2 inch high. **Labeling and marking** of the SLP-22 container or compartment containing detonators is **not required when the compartment is an integral part of the vehicle body or the container is permanently attached to the motor vehicle.** This applies even when the detonators are in inner packaging only, as authorized in Table 2 above, and the motor vehicle contains any quantity of Class 1 materials and is placarded accordingly.





















# Explosives Packages in Transportation

For all packaging containing explosives, the following ***must*** appear:

- EX Approval Number (on package or shipping paper)
- Hazard Label
- Proper Shipping Name (General Marking)
- UN I.D Number
- UN Packaging Specification Marking





# Shipping Papers

- UN I.D. Number
- Proper Shipping Name
- Hazard Class, Division and Compatibility Group
- Packing Group in Roman Numerals (not required for class 1)
- For Class 1 Materials, Quantity Must be the Net Explosive Mass
- EX Number Can be Placed on Either Packaging *or* Shipping Paper
- The Number and Type of Packages Must be Included
- Must Provide an Emergency Response Telephone Number
- Special Permit Number (50lbs ANFO Bags, Bulk Truck)







# Net Explosive Mass

- It's a math problem
- $\text{NEM for entire box} \div \text{quantity} = \text{NEM per item}$
- Easy to spot on detonator and shock tube entries





1.4B 1.4B 1.4B

NONEL® EZ Det®

**DXAB629**  
Material No.  
Production No. 100538351 33 / 40

QUANTITY  
QUANTITE  
CANTIDAD **40**

**30**  
FT/PI  
**9**  
METERS

	LB.	KG.
Gross Wgt.	10.52	4.77
Net Wgt.	8.24	3.74
N.E.C.	0.071	0.032

EX - 2002010272  
UN 0361  
1.4B

**25JY11W1-0164**  
Date Code

**DELAY**  
RETARD RETARDO  
**25 / 350**  
ms  
STK# 20422

**DYNO**  
Dyno Nobel  
Groundbreaking Performance











# Inspection Issues





# What PHMSA Investigators Look For

Importers, shippers, and transporters have the responsibility to ensure the requirements are met within the IMDG and 49 CFR.

- Does the packaging meet the requirements? (§173.62 and EX approval)
- Are the packages UN certified and closed properly?
- Is the hazard label correct?
- Does the shipping paper provide the correct information?
- Training (gen aware, function spec, safety, security (2)
- Security plan (any qty 1.1, 1.2, 1.3 >1000lbs 1.4, 1.5, 1.6)







# Security Plan

- Risk Assessment (Site Specific)
- Management Designations/Job Titles & Duties
- Reviewed Yearly
- Training
- Personnel Security (background checks)
- En-route Security (company vs commercial)
- Access Security





# Common Violations

- Unapproved Explosives (jet guns/FW/other)
- None or improper IME-22 (§177.835(g)(3))
- Loose Detonators in IME-22 (no inner package)
- No waterproof/fire resistant tarp §177.835(h)
- None or incomplete security plans §172.800





# Shipping Paper Violations

- No Net Explosive Mass on shipping paper §172.202(a)(5)(i)
- Double entry for jet guns – list gun and individual components
- EX number (packaged products/bulk products) §172.320(d)
- SP # 11156 for bagged ANFO
- Sequence, name, UN number





# Other Violations

- Bulk truck tank inspections (180.407 & Special Permits)
- Training violations (172.704)
  - Person creating shipping papers
  - CDL/hazmat endorsement not a substitute
  - Training records







## §Appendix A to Subpart D of Part 107

B. Class 1—Explosives:		
1. Failure to mark the package with the EX number for each substance contained in the package or, alternatively, indicate the EX number for each substance in association with the description on the shipping description	172.320	\$1,000.
2. Offering an unapproved explosive for transportation:	173.54, 173.56(b).	
a. Division 1.4 fireworks meeting the chemistry requirements of APA Standard 87-1		\$5,000.
b. Division 1.3 fireworks meeting the chemistry requirements of APA Standard 87-1		\$7,500.
c. All other explosives (including forbidden)		\$12,500 and up.





3. Offering an unapproved explosive for transportation that minimally deviates from an approved design in a manner that does not impact safety:	173.54, 173.56(b).	
a. Division 1.4		\$3,000.
b. Division 1.3		\$4,000.
c. All other explosives		\$6,000.
4. Offering a leaking or damaged package of explosives for transportation:	173.54(c).	
a. Division 1.3 and 1.4		\$12,500.
b. All other explosives		\$16,500.
5. Offering a Class 1 material that is fitted with its own means of ignition or initiation, without providing protection from accidental actuation	173.60(b)(5)	\$15,000.
6. Packaging explosives in the same outer packaging with other materials	173.61	\$9,300.
7. Transporting a detonator on the same vehicle as incompatible materials using the approved method listed in 177.835(g)(3) without meeting the requirements of IME Standard 22	177.835(g)(3)	\$10,000.





C. Stowage/Attendance/Transportation Requirements:		
1. Transporting packages of hazardous material that have not been secured against movement	Various	\$3,700 and up.
2. Failure to properly segregate hazardous materials	Various	\$9,300 and up.
3. Failure to remove a package containing hazardous materials from a motor vehicle before discharge of its contents:	177.834(h).	
a. Packing Group I and §172.504 Table 1 materials		\$5,000.
b. Packing Group II		\$3,000.
c. Packing Group III		\$1,000.
4. Transporting explosives in a motor vehicle containing metal or other articles or materials likely to damage the explosives or any package in which they are contained, without segregating in different parts of the load or securing them in place in or on the motor vehicle and separated by bulkheads or other suitable means to prevent damage	177.835(i)	\$6,500 and up.
5. Failure to attend Class 1 explosive materials during transportation	177.835(k)	\$3,000.
6. Transporting railway track torpedoes outside of flagging kits, in violation of DOT-E 7991	171.2(b), (e)	\$8,700.
7. Failure to carry a hazmat registration letter or number in the transport vehicle	107.620(b)	\$1,000.





# New Bulk Truck Rule

- July 15, 2014 a notice of proposed rulemaking (NPRM) titled, “Hazardous Materials: Requirements for the Safe Transportation of Bulk Explosives (RRR)” HM-233D was published in the Federal Register.
- A copy of the rule may be viewed at <https://www.federalregister.gov/articles/2014/07/15/2014-16382/hazardous-materials-requirements-for-the-safe-transportation-of-bulk-explosives-rrr>
- Comment period ends 09/15/2014
- IME SLP-23





# Questions?

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